## REMARKS

This Amendment is in response to the non-final Office action (Paper No. 20070914) mailed on 20 September 2007. Reexamination and reconsideration are respectfully requested.

**Listing of The Claims**

Pursuant to 37 CFR §121(c), the claim listing, including the text of the claims, will serve to replace all prior versions of the claims, in the application.

**Status of The Claims**

Claims 1 through 10 are pending in this application.

**Amendment of The Claims**

Claims 3, 7, 9 and 10 are amended.

**Issues Raised by Paper No. 20070914**

**Claim Rejections - 35 U.S.C. §103**

**I. Rejection of Claims 1-10 under 35 U.S.C. §103(a) as being unpatentable over Choe (U.S. Patent No. 7,031,320), in view of Liu *et al.* (U.S. Patent No. 6,018,526).**

Claims 1-10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Choe (U.S. Patent No. 7,031,320), in view of Liu *et al.* (U.S. Patent No. 6,018,526).

**I-1. The primary difference between the pending claims and the prior art is that the prior art fails to teach or suggest** distinguishing between the packet received from the external router and the packet received from the switching unit.

The present invention relates to a distributed architecture router with a ping-pong preventing function. The present invention aims to prevent the ping-pong phenomenon which occurs due to propagation delay between the time when a routing table is updated in a main processor and the time when a forwarding table is updated in a forwarding engine. Thus, user packets entering a distributed router during the propagation delay are transmitted through a routing path that has not yet been updated, that is consequentially an incorrect routing path.

Specifically, normally, a packet is transmitted from a first external router to a first line connection unit; the first line connection unit transmits the packet to the switching unit; the switching unit transmits the packet to a second line connection unit as designated by the forwarding information of the packet; and the second line connection unit transmits the packet to a second external router. The "ping-pong" phenomenon occurs when the routing information is updated in the main processor, and the first line connection unit receives the updated forwarding information although the second line connection unit has not yet received the updated forwarding information. Therefore, when the first line connection unit transmits the packet to the second line connection unit through the switching unit according to the updated forwarding information, the second line connection unit transmits the packet back to the first line connection unit according to the old, outdated forwarding information. In order to prevent this "ping-pong" phenomenon, the forwarding processor in the second line connection unit checks the forwarding information of the packet received from the switching unit, and discards the

packet if the forwarding information indicates that the packet is to be transmitted back to the first line connection unit.

Therefore, in the ping-pong prevention method of the present application, when a line connection unit receives a packet, the packet might come from a switching unit, or from an external router:

- if the packet comes **from an external router**, then the packet is transmitted by the forwarding processor of the line connection unit to the switching unit, and is subsequently transmitted to another line connection unit.
- if the packet comes **from the switching unit**, then:
  - if the forwarding table of the line connection unit which receives the packet is updated, the output direction of the packet is **toward an external router** and the packet is transmitted to the external router;
  - if the forwarding table of the line connection unit which receives the packet is old, the output direction of the packet is **toward the switching unit** and the packet is discarded.

Choe'320 relates to a method for constructing routing/forwarding tables for an IP address lookup using a skip list. The method comprises dividing a prefix length range of an IP address in a preset method; creating a header node having a maximum level based on a number of clusters divided into the prefix length range, the header node pointing

every node in the skip list; and creating subnodes by the number of the divided clusters, the subnodes each having the divided prefix length range as a key.

Liu *et al.* '526 relates to a device for coupling a first network medium to a second network medium. A first port is coupled to the first network medium and a second port coupled to the second network medium. A memory stores a first plurality of indications and a second plurality of indications. The indications in the first plurality of indications correspond to respective sets of addresses and indicate whether at least one address in the respective set of addresses may be accessible through the first network medium. The indications in the second plurality of indications correspond to respective sets of addresses and indicate whether at least one address in the respective set of addresses may accessible through the second network medium. A connecting circuit is coupled to the first port, the second port, and the memory. The connecting circuit causes the ports to pass or block a packet from the first network to the second network. The packet has a destination address. The connecting circuit causes the ports to pass or block based on a first indication from the first plurality of indications and a second indication from the second plurality of indications. The first indication corresponds to a set of addresses including the destination address of the packet. The second indication corresponds to the set of addresses including the destination address of the packet.

Dobbins *et al.*'820 relates to an apparatus and method wherein multiple router interfaces are assigned the same IP network address, creating an IP work group. This enhances host mobility by allowing, in one embodiment, a host to be relocated anywhere

in the work group without requiring reconfiguration of the host. As a further option, host address ranges may be specified (i.e., locked) to designated interfaces of the work group, to enhance security by restricting the allowed host mobility within the work group. An additional advantage is a reduced consumption of network and subnet addresses, because now a single address is used for several physical networks.

Among other differences, there are two major differences between your client's invention and the combination of Choe '320 and Liu '526:

a. The present invention determines whether to forward a packet in dependence upon a source address of the packet; while combination of Choe '320 and Liu '526 teaches determining whether to forward a packet in dependence upon a destination address of the packet (Liu '526, column 5, lines 18-19).

b. The present invention distinguishes between the packets that are received from the external router and the packets that are received from the switching unit; while the combination of Choe '320 and Liu '526 teaches distinguishing between the packets that are destined to local addresses and the packets that are destined to non-local addresses (Liu '526, column 5, lines 8-10).

c. The present invention teaches a main processor for performing routing and a forwarding process, that is separate from the main processor, for

performing forwarding; while the combination of Choe '320 and Liu '526 teaches a bridge device that performs both routing and forwarding.

The following flow chart (Figure 1) illustrates the ping-pong prevention process of the current application. In comparison, the flow chart in Figure 2 illustrates the method used in Liu '526's method. Apparently, Liu '526's method omitted the step of checking the source address of the receiving packet.

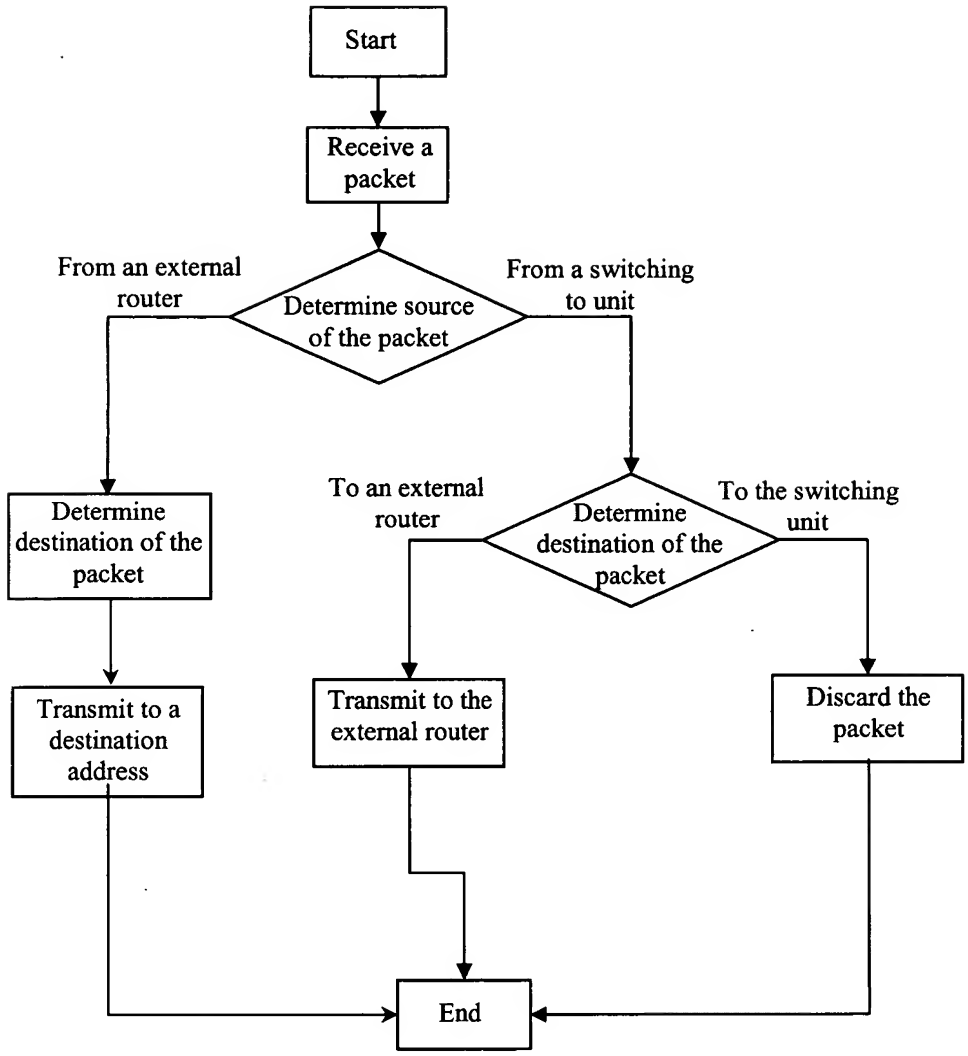



**Figure 1. Ping-pong prevention process of the present invention.**

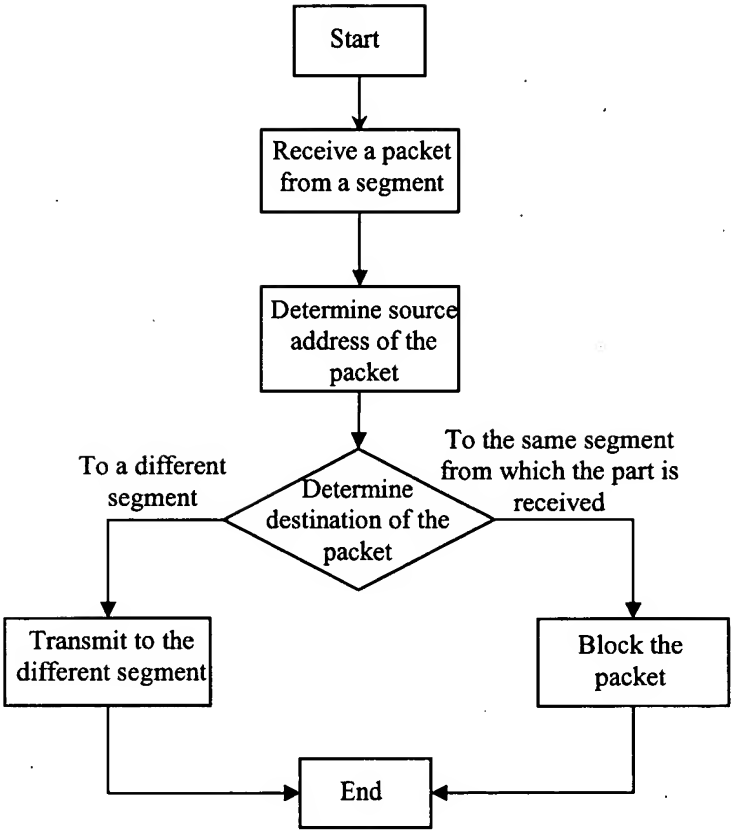



**Figure 2. Liu '526's method.**

**I-2. Claims 1, 4, 5 and 9**

**I-2-1.** Regarding claims 1, 4, 5 and 9, on page 4 of Paper No. 20070914, the Examiner stated:

> "(Choe clearly discloses and shows) a plurality of forwarding processors (fig. 1 (each box with a FT); fig. 3) positioned in different corresponding ones of the plurality of line connection units, to receive the changes of routing information broadcast by the main processor through the internal InterProcessorCommunication paths of the distributed router, update different corresponding ones of the forwarding tables (column 6, lines 53-55), to ascertain an output port by looking-up forwarding information in corresponding ones of the forwarding tables for packets received from external routers, and transmitting the packets to the output ports ascertained (fig. 3; column 7, lines 31-38), to determine whether an

> output port of a packet received from the switching unit is connected to the external router or to the switching unit by looking-up the forwarding information in the corresponding forwarding table for the packet (column 7, lines 31-38), and to transmit the packet to the external router when the determined is toward the external router (column 6, lines 58-64).
>
> However Choe fails to disclose that the packet will be discarded if the output direction is to the switch.
>
> In the same filed of endeavor, Liu et al. clearly disclose that the packet will be discarded when the determined output direction of the transmission is toward the switching unit (fig. 1, column 4, lines 66-67, column 5, lines 1-19 (The bridge blocks packets route back to local addresses. This includes self-addressing packet (DA=SA) and packets that the switch routes to the card and the card sends it back to the switch in order to be routed back to local address); column 13, lines 25-31 (discard packet is checking failed)).
>
> Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate a distributed router, as taught by Choe, and the implementation of loop prevention method, as taught by Liu et al., so that the flow of packets in the distributed network will be enhanced."

Applicant respectfully traverses.

**First, the Examiner ignored Applicant's amendment filed on 5 June 2007.** Specifically, an amendment in response to the Examiner's first Office action (Paper No. 20070228) was filed on 5 June 2007, enclosing amendments to claims 1-5, 7, 8 and 10. Although the Image File Wrapper of the Patent Application Information Retrieval (PAIR) system shows that the Examiner has initialed the amendment filed on 5 June 2007, the Examiner failed to incorporate the changes to the claims into this Office action (Paper No. 20070914). For example, among other changes to the pending claims, in line 15 of claim 1,

> "to ascertain an output <u>port conforming to said transmission</u> by looking-up forwarding information in corresponding ones of the forwarding tables for packets received from external routers"

was amended by the to read,

> -- to ascertain an output direction of a packet received from an external router by looking-up forwarding information in corresponding ones of the forwarding tables for the packet received from the external router --.

(emphasis added). In the Office action (Paper No. 20070914), however, the Examiner stated on page 4:

> "(Choe clearly discloses and shows) ascertain an output port by looking-up forwarding information in corresponding ones of the forwarding tables for packets received from external routers, and transmitting the packets to the output ports ascertained (fig. 3; column 7, lines 31-38)".

Consequently, Applicant respectfully requests thorough consideration of the amendments filed on 5 June 2007.

**Secondly, Choe '320 fails to teach or suggest distinguishing by the forwarding processor between the packets received from the external router and the packets received from the switching unit, as claimed in the pending claims 1, 4, 5 and 9.** Choe '320's column 7, lines 31-38 as cited by the Examiner merely teaches transferring the packet input through the input interface to the corresponding output interfaces by consulting the forwarding table. Because there is no disclosure in Choe '320 that which one of the *n* input interfaces in FIG. 3 is the switching unit, and which one of the *n* input interfaces is the external router, Choe '320 fails to teach or suggest determining the source address of the packet, if the packet is received from an external router, transmitting the packet to the destination of the packet, and if the packet is received from the switching unit, determining the destination address of the packet, if the

packet is destined to an external router, transmitting the packet to the external router, and if the packet is destined to the switching unit, discarding the packet, as claimed in claims 1, 4, 5 and 9.

**Thirdly, nowhere in Choe '320 does Choe '320 teach or suggest the "InterProcessor Communication paths" as defined in the pending claims.** Choe '320 merely teaches that the forwarding table FT is copied from the routing table in the routing processor. Choe '320 fails to teach, however, that the forwarding table is copied from the main processor via the InterProcessor Communication path.

**I-2-2.** Regarding claims 1, 4, 5 and 9, on page 5 of Paper No. 20070914, the Examiner expressly admitted that:

> "Choe fails to disclose that the packet will be discarded if the output direction is to the switch".

And the Examiner continued to argue that:

> "In the same field of endeavor, Liu et al. clearly disclose that the packet will be discarded when the determined output direction of the transmission is toward the switching unit (fig. 1, column 4, lines 66-67, column 5, lines 1-19 (The bridge blocks packets route back to the local addresses. This includes self-addressing packet (DA=SA) and packets that the switch routes to the card and the card sends it back to the switch in order to be routed back to local address); column 13, lines 25-31 (discard packet is checking failed)).
>
> Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate a distributed router, as taught be Choe, and the implementation of loop prevention method, as taught by Liu et al., so that the flow of packets in the distributed network will be enhanced."

Applicant respectfully traverses.

**First, respectfully, Liu '526 does not provide a motivation to modify Choe '320 because Liu '526 fails anticipate the problem of ping-pong phenomenon that the present invention is targeting to solve.** Specifically, as discussed in Section I-1, the present invention aims to prevent the ping-pong phenomenon which occurs due to a propagation delay between the time when a routing table is updated in a main processor and the time when a forwarding table is updated in a forwarding engine. In the ping-pone phenomenon, user packets that enter a distributed router during the propagation delay are transmitted through a routing path that has not yet been updated, that is consequentially an incorrect routing path. On the other hand, Liu '526's main processor does not separate with the forwarding processor. That is, Liu's bridge device performs both of routing and forwarding. Therefore, Liu's routing table and the forwarding table are located at the same place, and thus there is no time difference between the updating of the routing table and the updating of the forwarding table. Consequently, the ping-pong phenomenon does not take place in Liu '526. As stated in Manual of Patent Examining Procedure (MPEP),

> "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. In re Kahn, 441 F.3d 977, 986, 78 USPQ2d 1329, 1335 (Fed. Cir. 2006)". [1]

Accordingly, there is no suggestion to combine Liu '526 and Choe '320 to arrive at the claimed invention.

**Secondly, respectfully, Liu '520 fails to teach or suggest determining, by a forwarding processor, whether to forward a packet in dependence upon the source**

[1] MPEP §2143.01.I.

**address of the packet.** Liu '520 discloses determining whether to forward the packet based on the destination address of the packet. See the cited passage of Liu '520:

> column 5, lines 8-10, "Bridge helps to block packets that are destined to local addresses and pass packets that are destined to non-local addresses"; and
>
> column 5, lines 15-19, "When bridge device 21 receives a new packet, bridge device 21.....also decides whether to forward the packet based on the destination address of the packet."

Take Applicant's FIG. 2 as an example. In FIG. 2, according to an outdated routing information, a packet that is originated from line connection unit 1 should be transmitted to line connection unit 2 (route 2 in FIG. 2); whereas according to an updated routing information, the packet that is originated from line connection unit 1 should be transmitted to line connection unit 3 (route 1 in FIG. 2). If line connection unit 2 has received the updated routing information, line connection unit 2 will forward the packet that is originated from line connection unit 1 to line connection unit 3 in accordance with the updated routing information. At this time, if line connection unit 3 has not received the updated routing information, line connection unit 3 will forward the packet that is originated from line connection unit 1 to line connection unit 2 in accordance with the outdated routing information. As a result, ping-pong phenomenon occurs. If Liu's method is applied, line connection unit 2 would still forward the packet that is originated from line connection unit 1 to line connection unit 3, because Liu '526's bridge only blocks the packets that are destined to local addresses (within the segment from which the packet originated). In other words, only when the packet that is originated from line

connection unit 1 is destined to line connection unit 1, the bridge will block the packet. In the case, because the packet that is originated from line connection unit 1 is destined to line connection unit 2, the bridge will not block the packet. Therefore, Liu's method can not solve the problem of ping-pong phenomenon as described in the present invention. In contrast, the present invention removes ping-pong phenomenon because the forwarding processor checks the forwarding information of the packet received from the switching unit, and discards the packet if the forwarding information indicates that the packet is to be transmitted back to the switching unit.

**Thirdly, respectfully, Liu '526 fails to teach or suggest discarding the packet received from the switching unit when the packet is toward the switching unit.** Liu '526 merely teaches **blocking** the packets that are destined to local address (within the segment from which the packet is originated). According to an extremely reputable dictionary (Merriam-Webster Dictionary), "block" means to "to hinder the passage, progress, or accomplishment of by or as if by interposing an obstruction", while "discard" means "to get rid of especially as useless or unwanted". In fact, Liu '526 merely teaches discarding an ill-formed packet when the bridge device is set to a full-packet store and forward mode. See column 13, lines 28-31 of Liu 526:

> "In the full-packet store and forward mode, packet is forwarded only after the complete packet is received and checked and **an ill-formed packet will be discarded** and the buffer reclaimed."

Therefore, Liu '526 does not teach "discarding" the packets that are destined to local address.

**Fourthly,** the cited passages of Liu '526 merely teaches transmitting, by a bridge device, a packet received from a segment to another segment, or blocking the packet if the destination address of the packet is the segment from which the packet is received. Because there is no disclosure in Liu '526 that which one of the segments 20, 22, 24, 26, 28 and 30 is the external router and which one of the segments is the switching unit, Liu '526 fails to teach or suggest transmitting the packet to the destination of the packet if the packet is received from an external router. Therefore, Liu '526 compares the source and destination of a packet **no matter** whether the packet is received from the external router or is received from the switching unit. Liu '526's comparing the source and the destination of a packet received from the external router is unnecessary because the packet received from the external router will be transmitted to the switching unit, and thus the source and destination of the packet received from the external router is apparently different. In contrast, the pending claims first determine the source of a received packet, and if the packet is received from an external router, the packet is directly transmitted to the destination address, without further steps of comparing the source and destination of the packet. In this way, the unnecessary step of comparing the source and destination of a packet received from the external router is omitted, and system resource is saved.

Therefore, the combination of Choe '320 and Liu '526 fails to teach or suggest distinguishing by the forwarding processor between the packets received from the

external router and the packets received from the switching unit, as claimed in the pending claims 1, 4, 5, and 9.

**I-3. Claim 7**

Regarding claim 7, on page 6 of Paper No. 20070914, the Examiner stated:

> "Choe, as modified by Liu et al., clearly discloses and shows the method, wherein step 3 of the forwarding processor ascertaining input and output ports, comprises:
>
> a step 3-1 with the forwarding processor ascertaining the output port of the packet received from an external router by searching the forwarding table for the packet and transmitting the packet to the output port ascertained (column 7, lines 31-38);
>
> a step 3-2 with the forwarding processor ascertaining the output port of the packet received by searching the forwarding table for the output port of the packet received from the switching unit, and transmitting the packet when the output port is an external router (column 6, lines 58-64).
>
> However, Choe fails to disclose that the packet will be discarded if the output direction is to the switch.
>
> In the same field of endeavor, Liu et al. clearly disclose that the packet will be discarded when the determined output direction of the transmission is toward the switching unit (fig. 1, column 4, lines 66-67, column 5, lines 1-19 (The bridge blocks packets route back tot he local addresses. This includes self-addressing packet (DA=SA) and packets that the switch routes to the card and the card sends it back to the switch in order to be routed back to local address); column 13, lines 25-31 (discard packet is checking failed)).
>
> Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate a distributed router, as taught be Choe, and the implementation of loop prevention method, as taught by Liu et al., so that the flow of packets in the distributed network will be enhanced."

Applicant respectfully traverses.

Respectfully, the Examiner ignored claim 7's "the packet received from an external router" in lines 3-4 of claim 7, and "the packet received from the switching unit"

in lines 6-7 of claim 7. As discussed in the previous section, the present invention first distinguishes between the packets received from the external router and the packets received from the switching unit, and then performs different processes on different packets. In this way, unnecessary processing on the packet received from the external router is avoided. Neither Choe '320 nor Liu '520 teaches this step of distinguishing between the packets received from the external router and the packets received from the switching unit. Therefore, the pending claim 7 is patentably distinguishable from the combination of prior art.

**I-3. Claim 7**

Regarding claim 7, on page 6 of Paper No. 20070914, the Examiner stated:

> "Choe, as modified by Liu et al., clearly discloses and shows the router, with said forwarding processor comprised of:
>
> when the packet has been received from said switching unit and said destination address indicates an output port of said corresponding one of said line connection units coupled to an external router, transmitting the packet to the external router (column 6, lines 58-64).
>
> However, Choe fails to disclose that the packet will be discarded if the output direction is to the switch.
>
> In the same field of endeavor, Liu et al. clearly disclose that the packet will be discarded when the determined output direction of the transmission is toward the switching unit (fig. 1, column 4, lines 66-67, column 5, lines 1-19 (The bridge blocks packets route back tot he local addresses. This includes self-addressing packet (DA=SA) and packets that the switch routes to the card and the card sends it back to the switch in order to be routed back to local address); column 13, lines 25-31 (discard packet is checking failed)).
>
> Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate a distributed router, as taught be Choe, and the implementation of loop prevention method, as taught by Liu et al., so that the flow of packets in the distributed network will be enhanced."

Respectfully, claim 10 is amended to add the following sentence:

> "when the packet has been received from an external router, transmitting the packet to a destination address associated with the packet."

As discussed in the previous section, the present invention first distinguishes between the packets received from the external router and the packets received from the switching unit, and then performs different processes on different packets. In this way, unnecessary processing on the packet received from the external router is avoided. Neither Choe '320 nor Liu '520 teaches this step of distinguishing between the packets received from the external router and the packets received from the switching unit. Therefore, the amended claim 10 is patentably distinguishable from the combination of prior art.

**II. Rejection of Claims 3 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Choe (U.S. Patent No. 7,031,320), in view of Liu *et al.* (U.S. Patent No. 6,018,526), and further in view of Dobbins *et al.* (U.S. Patent No. 5,751,971).**

Claims 3 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Choe (U.S. Patent No. 7,031,320), in view of Liu *et al.* (U.S. Patent No. 6,018,526), and further in view of Dobbins *et al.* (U.S. Patent No. 5,751,971).

Regarding claim 3, on pages 8-9 of Paper No. 20070914, the Examiner stated:

> "Choe, as modified by Liu et al., clearly discloses and shows the distributed router, wherein a lookup table storing address indices for the forwarding tables where information on each packet is stored (fig. 3; column 7, lines 31-38);
>
> a lookup control unit (fig. 3, (route lookup); column 7, lines 31-38 (route lookup controller)) latching the address of the forwarding table intended for reference from the lookup table using the IP address extracted by the IP header analyzing unit, reading forwarding information from the forwarding table, and making a determination transmission when an

output port of the packet input from the switching unit is a port directed to an external router (column 6, lines 58-64);

However, Choe fails to disclose that the packet will be discarded if the output direction is to the switch.

In the same field of endeavor, Liu et al. clearly disclose that the packet will be discarded when the determined output direction of the transmission is toward the switching unit (fig. 1, column 4, lines 66-67, column 5, lines 1-19 (The bridge blocks packets route back tot he local addresses. This includes self-addressing packet (DA=SA) and packets that the switch routes to the card and the card sends it back to the switch in order to be routed back to local address); column 13, lines 25-31 (discard packet is checking failed)).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate a distributed router, as taught be Choe, and the implementation of loop prevention method, as taught by Liu et al., so that the flow of packets in the distributed network will be enhanced."

Respectively, lines 9-14 of claim 3 are amended to read:

"a lookup control unit latching the address of the forwarding table intended for reference from the lookup table using the IP address extracted by the IP header analyzing unit, reading forwarding information from the forwarding table, **when a packet is received from the switching unit** and an output direction of the packet is toward an external router, making a determination to transmit the packet to the external router, **when a packet is received from the switching unit** and the output direction of the packet is toward the switching unit, making an determination to discard the packet, and **when a packet is received from an external router**, transmitting the packet to an output address associated with the packet;"

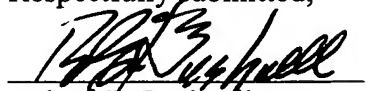
In the amended claim 3, the lookup control unit first distinguishes between the packets received from the external router and the packets received from the switching unit, and then performs different processes on different packets. In this way, unnecessary processing on the packet received from the external router is avoided. Neither Choe '320 nor Liu '520 nor Dobbins '971 teaches this step of distinguishing between the packets received from the external router and the packets received from the switching unit.

Therefore, the amended claim 3 is patentably distinguishable from the combination of prior art.

In view of the foregoing amendments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. If there are any questions, the examiner is asked to contact the applicant's attorney.

No fee is incurred by this Amendment.

Respectfully submitted,



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